

THE GENUS *NOMOCHARIS*.

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Of the many remarkable plants which recent exploration of Western China has brought to our knowledge, none take precedence over those which Franchet included in his new genus *Nomocharis*. They are liliaceous, and occupy a position in the family between *Lilium* itself and *Fritillaria*. In that area are several plants whose relationship with *Lilium* on the one hand and *Fritillaria* on the other are subjects of discussion, and if *Nomocharis* adds another to this group of forms, it also brings information which throws light upon the affinities of debatable species. Franchet named only one species—*N. pardanthina*—when he described the genus *Nomocharis*, and by way of introduction to what I am to say about the genus, I give here a translation of Franchet's description of both genus and species:—

Nomocharis, Franch.¹

“Perianth deciduous, segments spreading dissimilar; calycine segments ovate, shortly acuminate, quite entire,

¹ Franchet in Journ. de Bot. iii (1889), 113. Franchet's words are:—

Nomocharis.—Perianthium deciduum, segmentis patentibus dissimilibus; calycis segmenta ovata, breviter acuminata, integerrima, foveola destituta; petala late ovata, margine dentato-fimbriata, basi foveolata; foveola magna, flabelliformis, e medio a limbo soluta, multifida, lobis oblongis incis; stamina 6, basi segmentis breviter coalescentibus illisque duplo breviora; filamenta inferne circiter ad medium usque inflato-claviformia, parte inflata cava apice rotundata, exinde subulata; antherae oblongo-ovatae, medio dorsofixae, e laterè longitudinaliter dehiscentes; discus tenuis, annularis, integer, parvus; ovarium sessile, ovato-oblongum, triloculare, loculis multiovulatis; stylus capsulae subaequilongus, apice paulo incrassatus, stigmatè obscure trilobo; capsula ignota.

Bulbus squamosus, squamis albidis oblongis, carnosus, imbricatis; fibrae radicales crassae, nunc fusiformes, villosae; caulis pedalis vel paulo ultra; folia lanceolata, sparsa vel 3-6 verticillata; flores 1 vel 3-4 axillares, speciosi, virginei submutantes; sepala pallide rosei, saepius immaculati; petala rubescentia, maculis violaceis conspersa, foveola nigro-purpurea.

Genus inter *Lilium* et *Fritillariam* medium; bulbi indole, antheris dorsofixis styloque Liliis vere affinis; petalis foveolatis ad *Fritillariam* vertitur. Ab utroque genere differt: staminum filamentis parte inferiore inflatis, cavisque; foveola multifida et semilibera, quod in nullo

destitute of foveola; petaline segments broadly ovate, margin dentate-fimbriate, foveolate at base; foveola large, fan-shaped, forming a free limb above the middle, much cleft, lobes oblong, incised; stamens 6, slightly adhering to the base of the perianth-segments and one-third their length; filaments from base to the middle inflated-club-shaped, inflated portion hollow, rounded at summit, beyond the inflated portion subulate; anthers oblong-ovate, dorsifixed at the middle, dehiscing longitudinally at the sides; disk thin, annular, entire, small; ovary sessile, ovate-oblong, trilocular, loculi many-ovuled; style about equalling in length the ovary, apex slightly thickened, stigma obscurely trilobed: capsule unknown.

“Bulb squamate, scales whitish oblong, fleshy, imbricate; root-fibres thick, sometimes fusiform, villous; stem a foot high or a little more; leaves lanceolate, sparse or 3-6 in a whorl; flowers 1 or 3-4 axillary, showy, slightly nodding; sepals pale rose, more often unspotted; petals rubescent, sprinkled with violet spots, foveola black-purple.

“Genus midway between *Lilium* and *Fritillaria*; truly related to *Lilium* by the nature of the bulb, dorsifixed anthers,

genere affini observatum; perianthii lobis exterioribus et interioribus dissimilibus, omnibus late patentibus.

N. pardanthina.—Yun-nan, in pascuis montis Koua-la-po, supra Hokin; fl. 2 jun. 1883 (Delavay, no. 257).

Le tubercle est formé d'écailles étroites, charnues, comme celui de certain Lis; dans les individus grêles les feuilles sont ordinairement éparées et la fleur solitaire. Les individus robustes, atteignant jusqu'à cm. 60, ont presque toujours les feuilles verticillées par 4-6, sauf les inférieures et les supérieures, et ils ont jusqu'à 4 fleurs larges de 6-8 cent.; ces fleurs sont très ouvertes; leur divisions étalées horizontalement présentent la particularité singulière d'être nettement dissemblables. Les 3 externes ovales, entières sur les bords, sont le plus souvent dépourvues de macules violacées; les 3 intérieures largement ovales, à bords dentés-fimbriés, parsemées de taches d'un pourpre brun, offrent en outre à leur base une large macule d'un pourpre foncé en partie recouverte par une écaille flabelliforme qui est libre dans sa moitié supérieure et divisée jusqu'au milieu en 5-8 lobes étroits, élargis et lobulés au sommet.

Les filets staminaux sont très remarquables par le renflement de leur portion inférieure, obovale-claviforme, creuse et à parois très minces, arrondie au sommet et surmontée par une pointe subulée qui porte l'anthère insérée par le milieu du dos.

Cette charmante Liliacée, qu'on peut espérer voir cultiver un jour, fait l'ornement des pâturages à sol calcaire de la montagne de Koua-la-po, dans le district de Tali, où elle végète parmi les herbes, à la manière des Lis.

and the style: inclining to *Fritillaria* by the foveolate petals. From both genera it differs by: the hollow inflated lower part of staminal filaments; the much-cleft and half-free foveola, which is seen in no allied genus: the dissimilar outer and inner lobes of the perianth, which are all widely spreading.

“*N. pardanthina*, Franch.

“Yunnan:—In pastures of Mt. Koua-la-po, above Hokin: fl. 2 Jun. 1883 (Delavay, No. 257).

“The tubercle is formed of straight, fleshy scales like those of certain lilies; in weak individuals the leaves are ordinarily scattered and the flower solitary. Robust individuals reach as much as 60 cm. in height, have the leaves almost always in whorls of 4-6, excepting the lower and upper ones, and have as many as 4 broad flowers of 6-8 centimeters; these flowers are very open; their divisions stretched out horizontally present the singular feature of being markedly dissimilar. The 3 outside ones are oval, entire, and more often without violet spots; the 3 inside ones, broadly oval, toothed and fimbriate, and sprinkled with purple-brown spots, have at their base a large blotch of a deep purple colour in part covered by a fan-shaped scale which is free in its upper half, and divided as far as the middle into 5-8 lobes expanded and lobulate at the top.

“The staminal filaments are very remarkable by the voluminous expansion of their lower portion, which is oboval-club-shaped, hollow with thin walls, rounded at the summit and surmounted by a subulate point which bears the anther inserted by the middle of its back.

“This charming liliaceous plant, which one may hope to see in cultivation one day, is an ornament of the pastures on the calcareous soil of Mount Koua-la-po in the district of Tali, where it grows amongst herbs after the fashion of a lily.”

Franchet's expectation has been realised. *N. pardanthina* flowered in the Royal Botanic Garden, Edinburgh, in 1914, in plants raised from seeds collected by George Forrest (No. 5816) for Bees Ltd., some of which were generously presented to us. The plant was exhibited on 6th June 1916

at the Royal Horticultural Society, where it was awarded a First Class Certificate. It is a beautiful plant, and well worthy of cultivation for itself. If it takes in hybridisation, it should originate a remarkable race of garden plants. The habit certainly suggests *Lilium* rather than *Fritillaria*. How far that is borne out by analysis and comparative investigation will be set forth in what follows here.

Before passing to this, I must say something of other known forms of *Nomocharis*.

Shortly before our plant of 1914, which had rose-coloured flowers, opened its blooms, a plant of the genus *Nomocharis*, raised from seeds also collected by George Forrest, flowered at Edinburgh in one example only, producing a large open flower with a white ground spotted maroon all over both sepaline and petaline segments, recalling, indeed, the colouring of the more spotted varieties of *Odontoglossum crispum*. In addition, the petaline segments at base were blotched a deep purple-red. From this flower we were fortunate in obtaining seeds—most fortunate, indeed, because by one of these accidents to which in these days we are particularly liable our old plants, both of it and of *N. pardanthina*, were destroyed. In Forrest's dried collections there are specimens of this *Nomocharis* with white and spotted flowers under Nos. 3845, 7160, and 11,624, the flower in 7160 being by far the finest. On his field-tickets Forrest describes the flowers as "satiny white" or "watery white" and spotted, and he also says they are fragrant. (Amongst his specimens is also one under No. 3844, of which he writes, "variety with flowers pure white," and the solitary flower bears out the description, showing no spots.) Without doubt a *Nomocharis*, this plant seems to be a different species from Franchet's *N. pardanthina*, and the description which I give of it here under the name *N. leucantha* tells the difference between them.

N. leucantha, Balf. f.¹

Bulb scaly narrowly ovate pointed about 3 cm. long and 1.5 cm. in diameter. At flowering time coated outside with

¹ *Nomocharis leucantha*, Balf. f.—Bulbus anguste ovato-oblongus, squamis carnosis acuminatis. Caulis ad 75 cm. altus. Folia ad medium 3-6-verticillata infra et supra per paria disposita, infima sparsa, lanceo-

mucilaginosously rotting remains of 3-year-old and older scales; chief scales of the bulb 5-6 2-year-old fleshy straw-coloured ovate tapering to a membranous erose decapitated summit adpressed connivent more or less surrounding withered base of stem of their year and enclosing flowering stem enwrapped in shorter 5-6 scales of the year which have fleshy bases and membranous top acute or obtuse. Roots somewhat fleshy. Stem as much as 75 cm. long and 5 mm. in diameter below first green leaves, above the bulb tuftedly rooting after fashion of lilies, bare of green leaves below over as much as 28 cm. and bearing there one or two sparse distant strap-shaped blunt mucronate scale-leaves. Green leaves in distant (often 7.5 cm.) whorls of 3-6 after a first solitary leaf often followed by a pair, at summit sometimes in pairs, lanceolate or rarely lower ones oval-lanceolate long-acuminate with a sharp point, as much as 9.5 cm. long 2.4 cm. broad, conspicuously 3-nerved with subsidiary intermediate parallel nerves, olive-green above, beneath paler somewhat glaucous. Flowers 2-3 distant racemose axillary to one leaf of uppermost whorls, pedicels stiff straight, at apex thickened and there nodding, slightly shorter than axillant leaf, spreading nearly horizontal. Perianth open spreading as much as 9 cm. in diameter; segments "watery" or satiny white all equal in length and spotted pale purple or crimson-maroon, petaline with deep purple-red 2-lobed basal blotch about 6 mm. long; sepaline segments with small median basal purple blotch and faint midrib eglandular, ovate as much as a little over 4 cm. long about 2 cm. broad, shortly acuminate ending in darker sometimes swollen tip, acuminate apex ciliate-fringed rest of margin entire eciliate; petaline nearly orbicular with prominent midrib as much as 3.5 cm. broad abruptly

lata longe acuminata ad 9.5 cm. longa 2.4 cm. lata papyracea, supra atroviridia subtus glauca. Flores distantes in racemum 2-3-florum laxè dispositi; pedicelli stricti patentes apice nutantes. Perianthum aperte patens ad 9 cm. diam. albidum nitens maculis pallide-purpureis vel kermesinis et varo rufescente basali notatum; segmenta inaequalia dissimilia, calycina eglandulosa ad 4 cm. longa 2 cm. lata breviter acuminata, apice obscure fimbriata, petalina suborbicularia ad 3.5 cm. lata abrupte acuminata, costa media prominula, margine superne dentato-fimbriata, basi biglandulosa glandula quaque labio inciso flabelliformi cristata. Stamina circ. 1.6 cm. longa ovarium subaequantia; filamentum pars inflata ad 9 mm. longa, apex subulatus ad 3 mm. longus; antherae circ. 8 mm. longae ad 3 mm. supra basin dorsifixae.

acuminate at summit and there ciliate-fringed, downwards through one half or more dentate-fringed, entire below, base with two nectar-glands one on each side of midrib, each covered by a fan-shaped incised or crested dark purple-red flap. Stamens about 1.6 cm. long; swollen base of filament deep purple about 9 mm. long, subulate apex about 3 mm. long; anther about 8 mm. long shortly apiculate, dorsifixed about 3 mm. from base. Gynaeceum about 1.7 cm. long; ovary oblong wider towards top; style clavate below the trumpet-shaped 3-lobed stigma.

Mid. W. Yunnan:—Tali Range. Eastern flank. Grassy situations on the margins of pine forests. Alt. 11,000–12,000 ft. Lat. 25° 40' N. Plant of 18–24 ins. Flowers watery white, blotched and spotted pale purple, base of perianth deep purplish-maroon, faintly fragrant. G. Forrest. No. 3845. June 1906.

Mid. W. Yunnan:—Tali Range. Eastern flank. Pasture on the margins of pine forests. Alt. 12,000–13,000 ft. Lat. 25° 40' N. Plant of 18–30 ins. Flowers satiny white spotted crimson-maroon. G. Forrest. No. 7160. Sept. 1910.

Mid. W. Yunnan:—Tali Range. Alt. 11,000 ft. Lat. 25° 40' N. G. Forrest. No. 11,624. Aug. 1913. Dup. of 1906–1910.

The chief points of difference between this species and *N. pardanthina* are:—a more robust and taller plant; the much longer and broader long-acuminate leaves; the white flowers with all the segments spotted purple or maroon.

This Forrestian species conforms well with the characters of *Nomocharis* as given first of all by Franchet. It is otherwise with a species placed in the genus by Franchet in 1898 with the name *N. meleagrina*. I have not seen *N. meleagrina*, Franch., and can only give here Franchet's account of it.

N. meleagrina, Franch. in Journ. de Bot. xii (1898), 196.¹

“Many feet high. Leaves linear lanceolate long-acuminate, upper sparse (middle and lower wanting).

¹ Franchet's description runs:—

Nomocharis meleagrina.—Pluripedalis; folia lineari-lanceolata, longe acuminata, superiora sparsa (inferiora et media desunt); flores axillares,

Flowers axillary long-pedicellate; pedicel 15 cm. long arcuate-patent equalling or exceeding the leaves. Perianth rose with equally and densely distributed broadish red-fuscous spots on all the segments, 7-9 cm. in diameter widely open, almost plane; calycine segments quite entire ovate lanceolate acute or shortly acuminate; petaline segments scarcely broader than calycine and equalling them in length, sparingly and subtly erose above; crest of the basilar nectar-gland deep red-fuscous, fan-shaped, variously incised. Stamens one-fifth the length of perianth. Style as long as ovary; stigma globose obscurely lobed.

"N.W. Yunnan:—Mt. Sela, banks of the Mekong. R. P. Soulié. No. 1032."

By description and by Franchet's comments we can recognise that this *N. meleagrina* is markedly different from *N. pardanthina* in the much larger leaves, apparently 15 cm. long, which are not whorled in upper part of the stem; long pedicels as long as the leaves; larger flowers; perianth-segments equal in length and breadth; all the perianth-segments equally and densely spotted; faint erosion only of upper part of petaline segments; stamens only one-fifth of length of perianth. It is clearly also not the same as *N. leucantha*.

Of its characters, that which is of importance as a criticism of the generic characters founded upon *N. pardanthina* is the slight dissimilarity of the sepaline and petaline segments:—they are similarly spotted, of equal length and breadth, and the petaline segments are scarcely erose on the margin above.

longe pedunculati, pedunculis 15 cent. longi, arcuato-patentibus, folia aequantibus vel superantibus; perianthium (diam. 7-9 cent.) late apertum, fere planum, roseum cum maculis latiusculis, rubro-fuscis, in omnibus foliis aequae ac dense distributis; foliola calycina integerrima ovato-lanceolata, acuta vel breve acuminata; foliola corollina calycinis vix latiora, illis aequilonga, superne parce et subtiliter erosa; cristae basiales intense rubro-fuscae, flabelliformes, varie incisae; stamina perianthio 5-plo breviora; stylus ovarii longitudine, stigmatibus obscure lobato, globoso.

Hab.—La Chine occidentale: province de Se-tchuen, sur les montagnes de Sela, sur les bords du Mekong (R. P. Soulié, n. 1032).

Diffère du *N. pardanthina* par ses feuilles plus grandes, éparses, et surtout par son perianthe dont les divisions sont égales et toutes couvertes de taches brunes, les trois intérieures à peine érodées sur les bords. Dans le *N. pardanthina*, les trois divisions intérieures sont presque arrondies, incisées-érodées dans leur moitié supérieure.

One other plant has been put in *Nomocharis*. Lévillé in 1913 published the name *Nomocharis Mairei*. Of this species all that Lévillé says is:—¹

“Scarcely 2 ft. high. Separated from *N. meleagrina* by its ovate leaves verticillate excepting the lower which are opposite; white terminal flowers; clavate stigma. Distinguished from *N. pardanthina* by its broad leaves and abruptly acuminate corolline segments.

“Yunnan:—Pastures of the plateau of Ta-hai, 3200 m., fl. white spotted black (internal divisions). E. E. Maire. July 1912.”

We have at Edinburgh specimens (No. 269, Herb. Edin.) obtained from Abbé Maire in 1913 bearing the same ticket, and it is without doubt the plant which Lévillé has named. Ta-hai is in N.E. Yunnan, about long. 103° 10' and lat. 26° 55'. In addition, we have the same plant in specimens (No. 107, Herb. Edin.) obtained from Abbé Maire, also in 1913,—labelled “Pastures of the summits at Pé-long-tsin. Alt. 3200 m., fl. white. E. E. Maire. July”—from the same region. I believe I know, therefore, what Lévillé had before him.

Maire's specimens do not fit Franchet's description of *N. meleagrina*. Prominent and valid differences are the shorter leaves, not long-acuminate: the much shorter flower-pedicels, not 4 cm. long—they are 15 cm. in *N. meleagrina*: the smaller white flowers with dissimilar sepaline and petaline segments; the toothed and fringed petals.

The two characters—broader leaves and abruptly acuminate corolla segments—by which Lévillé separates *N. Mairei* from *N. pardanthina* would not alone, if they existed, suffice as specific marks. As matter of fact, the petals of *N. pardanthina* are as abruptly acuminate as are those in Maire's plant, and the difference in leaf-width seems to be hardly appreciable. Maire's plant is not *N. pardanthina*, but Lévillé has not got hold of the dis-

¹ Lévillé in Fedde Repert. xii (1913), 287:—

Nomocharis Mairei.—Vix bipedalis. A *N. meleagrina* folia ovata, inferioribus oppositis exceptis, verticillata; flores albi terminales; stigma clavatum illam plantam secernunt. A *N. pardanthina* foliis latis et foliolis corollinis abrupte acuminatis dignoscitur.

Yun-Nan: Pâturages du plateau de Ta-Hai, 3200 m., fl. blanches mouchetées de noir (divisions internes), juill. 1912 (E. E. Maire).

tinctive characters. The plant is much more like *N. leucantha*. Indeed, in flower it is somewhat of a miniature form of that species. It differs from it, however, in foliage and other points, and is probably the N.E. Yunnan representative of this Mid. West Yunnan species. The following is a description of the plant based upon Maire's specimens in the Edinburgh Herbarium:—

Nomocharis Mairei, Lév. in Fedde Repert. xii (1913), 287
(revised character).

Stem as much as 35 cm. high with short internodes about 3 cm. long fairly stout about 4 mm. in diameter below the foliage-leaves. Foliage-leaves in whorls of 3-5 over the stem, below one or two single at the node followed by a pair, coriaceous ovate-lanceolate shortly acuminate, lower ones sometimes elliptic-ovate or ovate and obtuse, about 3.5-4 cm. long (lower ones a little shorter), 1.3 cm. broad (lower ones sometimes nearly 2 cm.). Flowers terminal solitary or in a 2-flowered raceme white with purple spots on petaline segments, rufescently blotched at base, pedicel stout ascending or erect straight to slightly deflexed tip, about equal in length to leaves. Perianth widely open almost flat as much as 5.5 cm. across; segments dissimilar more or less abruptly acuminate, tip obscurely fringed; calycine oval about 3 cm. long 1.5 cm. broad unspotted but with a small dark blotch at base, eglandular; petaline broadly ovate or rounded about 3 cm. long 2.5 cm. broad, margin from below middle toothed fringed, below entire, midrib prominent, with a bilobed basal gland, one lobe on each side of midrib, each lobe bearing a fan-shaped much incised fringed lip. Stamens about 1.2 cm. long; inflated lower part of filament about 6.5 mm. long about equalling ovary, subulate portion about 3 mm. long; anther barely 5 mm. long, dorsifixed about 1.5 mm. above base, shortly apiculate.

N.E. Yunnan:—Pastures of the plateau of Ta-hai. Alt. 3200 m. Flowers white spotted black. E. E. Maire. July. Herb. Edin. No. 269/1913.

N.E. Yunnan:—Pastures of the summits at Pé-long-tsin. Alt. 3200 m. Flowers white. E. E. Maire. July. Herb. Edin. No. 107/1913.

This plant resembles in white flowers with dark spotting *N. leucantha* rather than *N. pardanthina*, which has rose-coloured flowers. It is altogether a smaller plant than *N. leucantha*, has thicker leaves, more close-set, and without the long delicate acuminate tips we find in *N. leucantha*. The flowers, too, are much smaller. Most of the specimens show solitary terminal flowers, but one has a ripening ovary of a second flower below the terminal one.

All these plants which have been named *Nomocharis* are without doubt rightly placed in it. Whether specific rank can be maintained for all of them is a question that can only be answered with certainty when we know more about them. That the *N. pardanthina* and *N. leucantha* of cultivation are different species seems to me on the evidence to be unquestionable. *N. meleagrina* reads also distinct. *N. Mairei* is the doubtful species looking to *N. pardanthina* in foliage, to *N. leucantha* in flower characters. It is an outlier from the distribution of the other species. These are Mid. Western and W.N. Western Yunnan plants. It is from N.E. Yunnan, and we know that the plants of this area are, as a whole, different from, if nearly allied to, those of Western Yunnan. At the same time we are prepared in dealing with tuber-forming plants to find areas of specific distribution much wider than those of other plants. Prolonged hypogaeous life removes the plant—and the deeper the more effectively—from the influence of factors which act upon and bring about modifications in forms that have prolonged epigaeous life, and the greater constancy in conditions of life encourages greater constancy in form. The specific isolation which is so marked a phenomenon in the flora of the mountainous regions of Western China—see, for example, the genera *Primula* and *Rhododendron*—may quite well be less conspicuous in such a genus as *Nomocharis*, and the geographical distribution of *N. Mairei* cannot be regarded therefore as a point of much weight in relation to the question of its identity with species from farther west.

I turn now to the question of the position of *Nomocharis* as a genus. The leading characters of diagnosis may be stated thus:—

- (a) Squamate bulb.
- (b) Open perianth.
- (c) Dissimilar sepaline and petaline perianth-segments.
- (d) Fringed basal foveola on petaline segments only.
- (e) Swollen lower portion of staminal filament.
- (f) Dorsifixed anthers.
- (g) Style.

Taken by themselves in relation to those of *Lilium* and *Fritillaria* these characters seem to be decisive as differential generic marks. But, as is well known, the limit between *Lilium* and *Fritillaria* is difficult to define—if it really exists. On the one hand, there are the *Notholirions*, excluded from *Lilium* by Baker¹ and by Elwes, but included by Bentham and Hooker;² on the other hand, the *Liliorhizae*, which have been shuttled also from one genus to the other, are now placed in *Fritillaria* by Bentham and Hooker.³ Into both we have yet to see much more clearly before phyletic claims are established. A recent illustration of the difficulty which botanists have experienced in assorting forms is seen in the Szechwan plant which Franchet⁴ first of all named *Fritillaria lophophora*, suggesting at the same time that it might constitute under the name *Lophophora* a particular section of the genus. Subsequently Franchet transferred the species to *Lilium* as *Lilium lophophorum*.⁵ Now, in the light of further discoveries, it may be a question whether the place of this plant is in one of these genera, or is in *Nomocharis*, or in a new genus intermediate to *Lilium* and *Fritillaria*. After all, so far as nomenclature is concerned, it is a matter of convenience, seeing that our genera are only temporary expressions of reaction of a phyletic line, and what we have to strive after is a grouping and naming which shall best give us a picture of phyletic relations as they appear to us.

In order to obtain data for determining the best disposal of the forms brought together under *Nomocharis* I will now touch in succession upon the differential characters of the genus:—

¹ Baker in Journ. Linn. Soc., xiv (1875), 268.

² Bentham et Hooker, Gen. Plant., iii (1883), 817.

³ Ibid., Gen. Plant., iii (1883), 818.

⁴ Franchet in Journ. de Bot., v (1891), 153.

⁵ Ibid., xii (1898), 221.

The Scaly Bulb.—The elongated bulb with more or less ovate-lanceolate pointed scale-leaves of *Nomocharis* is very different in form from the short somewhat globose bulb with rounded tuberous scale-leaves of typical *Fritillaria*. It approaches somewhat the form found in *Lilium*, particularly that of *L. polyphyllum* as represented by Elwes.¹ It is not confined to *Nomocharis* outside *Lilium*. In 1839 Royle² briefly described under the name *Fritillaria oxypetala* a W. Himalayan plant which, like as it is in some features to the *Fritillarias* of previous descriptions, differs in certain obvious characters, and of these the bulb-form is one. The bulb if not quite the same as that of *Nomocharis*—there are many more and narrower shorter scales which are not so connivent at the top but more open—is yet cast on the same mould and is very different from what is found in *Eufritillaria*. Baker³ recognised the difference, and taking the bulb to be more lilioid than fritillarioid, he renamed the plant *Lilium oxypetalum*, Baker. Under this name Elwes⁴ figured the plant. Sir Joseph Hooker⁵ brings back the plant into *Fritillaria* and differentiates a new species, *F. Stracheyi*, Hook. f. (W. Himalaya), with the same form of bulb. This same form of bulb we meet with also in *Fritillaria lophophora*, Franch.⁶ (N.E. Yunnan and W. Szechwan), *F. flavida*, Rendle⁷ (S.W. Tibet), Ward sp. No. 758⁸ (S.E. Tibet), Ward sp. Nos. 741, 813⁹ (S.E. Tibet). In what follows I shall use the term *Oxypetala* for this group of fritillaries from the N.W. and W. Himalaya, S.E. Tibet, and W. China, which in their bulb-form are like *Nomocharis*—so like, indeed, as to negate the value of the bulb-form as a differential character of that genus.

I must not omit to mention a character of the stem in *Nomocharis* which may have phyletic significance. In all the species I have seen the stem shortly above the bulb

¹ Elwes, Monogr. Lil. (1880), t. 48.

² Royle, Illustr. Bot. Himal., i (1839), 388.

³ Baker in Journ. Linn. Soc., xiv (1875), 234.

⁴ Elwes, Monogr. Lil. (1880), t. 5.

⁵ Hook. f., Fl. Brit. Ind., vi (1892), 352.

⁶ Franchet in Journ. de Bot., v (1891), 153.

⁷ Rendle in Journ. of Bot., xlv (1906), 45.

⁸ Probably a new species of *Nomocharis* of the *Oxypetala* series (see p. 291).

⁹ Named *Nomocharis Wardii* on p. 297.

emits profusely lateral rootlets after the fashion of *Lilium*. I do not find this in the series *Oxypetala*. Does this mean that the bulb of *Nomocharis* lives in a shallower stratum of the soil than does *Fritillaria*?

The Open Perianth.—The open perianth of *Nomocharis* is one of its most striking features. The flower is as open as that of *Meconopsis*, and there may be even a slight reflexing from the base but never the recurving of *Lilium*. In no *Fritillaria* is there anything quite like it. At the same time, in the *Oxypetala* series we find the perianth not showing the typical campanulate form of *Fritillaria*. That may be a consequence of the absence of the median petaline foveola. The corolla is broadly funnel-shaped or concave, and in *F. oxypetala* is really open.¹ The character cannot be regarded as one defining *Nomocharis* in Franchet's sense. It appears in some other divergent forms collected by Forrest, Nos. 493, 10,620, and by Ward, No. 801, on the Burmo-Chinese frontier to fix the generic position which has led to my making this incursion into the field of *Lilium* and *Fritillaria*.

Dissimilarity of Sepaline and Petaline Segments.—In *N. pardanthina*, upon which Franchet founded *Nomocharis*, the contrast in form between sepals and petals is remarkable. The spotted petals are broad, nearly orbicular, with an abruptly acuminate tip, and the midrib is a relatively broad prominent ridge. The margin in about the upper half is more or less fringed, and the acuminate tip has a series of marginal outgrowths miniature of the fringe-segments of the broader part of the petal. As they lie in the expanded open flower they are cochlear imbricate and conceal the sepals save where the sepaline tips show in the corolline sinuses. The unspotted sepals, on the other hand, are ovate acute rather than acuminate, about the same length but only a little more than half as broad, and whilst they have the same reduced marginal outgrowths along their tips, want entirely the fringe of the margin of the broader portion.

The same contrast appears in *N. leucantha* and *N. Mairei*. But in *N. meleagrina* the petals and sepals are said to be all alike spotted, ovate-lanceolate, equally long and broad,

¹ See Bot. Mag. (1853), t. 4731, and Elwes, Monogr. Lil. (1880), t. 5.

and the dissimilarity is reduced to a trace of erosion of the margins of the petals in contrast with the quite entire margins of the sepals.

It would appear, then, that difference in size, shape, and spotting, between sepals and petals, is practically discarded as a generic character of *Nomocharis*.

In support of this we find in the *Oxypetala* series fluctuations in respect of these characters, and whilst all of them have upon the pointed tips of all the perianth-segments the reduced marginal outgrowths mentioned above as appearing in *Nomocharis*, in one,—*F. lophophora*—as Franchet himself points out, the base of the petaline segments is always minutely fringed.

Fringed Basal Foveola on Petaline Segments.—This character is made much of by Franchet, and he says it is seen in no allied genus. It requires therefore particular investigation.

The dice-box form of perianth that gives the name to *Fritillaria* is in great measure a consequence of the development in the middle line of each perianth-segment of a glandular area, long or short, forming a shallow pit or a deeper pit (foveola) with its long axis coincident with that of the segments. It occurs higher up or lower down on the segments, always below its middle, and gives a bulge outwards to the segments at the point where it occurs, its tissue being firmer, more fleshy, and usually darker coloured than the adjacent matrix of the segment. The surface of this area is coated with short projections—the excreting agents. This glandular area occurs on every perianth-segment. In the section *Rhinopetalum* of *Fritillaria* the bulge it forms is emphasised, and I take it gave origin to the sectional name. In the section *Petilium*—in so many features different from *Eufritillaria*—the form of the gland is nearly circular and it is basal but its position central on the perianth-segments. Now in *Nomocharis* the construction is different:—

(a) The sepaline segments have no glandular area. That is restricted to the three petaline segments.

(b) The glandular area is not in the middle line of the segment.

(c) The middle line is occupied by a strong midrib pro-

jecting on the upper surface of the segment and separating distinctly a left side of its lamina from a right side of its lamina at the base.

(d) The glandular area is at the base of the segment, and owing to the projection of the midrib it is divided into a left half and a right half, or, if you will, there are two glandular areas, a left-side one and a right-side one, and these are separated by the nonglandular midrib.

(e) Each of these dark-coloured glandular areas has arising from it a correspondingly dark-coloured flap ascending fan-ways and deeply incised, fringe-fashion, and the fringe-lobes are covered with excreting gland-cells. From dried specimens—and these are all I have been able to use for this analysis—it is not easy to be sure of minute anatomical details, and I cannot say to what extent each flap converts its glandular area into a pocket-gland, such as that which we meet with in *Ranunculus*; nor can I say whether the gland-area beneath the flap has excretory cells—certain is it the fringe-lobes of the flap are really glandular.

It is this spreading flap—*crista basilaris*—which has attracted most attention as a differential character, so far as gland-structure is concerned, in *Nomocharis*; but, after all, it is only a concentration of the excreting cells which in *Eufritillaria* are distributed more or less over the whole area. What is previous to it is the division of the glandular area into lateral halves separated by a raised midrib and the restriction of the glandular area to the petaline segments.

Were this construction peculiar to *Nomocharis* it might be taken as a strong generic character. But it is not so. In the whole series of *Oxypetala* (I except for the moment *E. flavida*, which I have not seen) we find a basal glandular area on the petaline segments only, a prominent midrib separating the glandular area into two divisions—a right and a left—the glandular area crested. In the cresting there are just such differences, so far as I can determine in dried specimens, as prevent our saying that it is that of *Nomocharis*. The somewhat regular fan-like expansion of a fringed flap is absent, and the cresting is distributed over the surface, extending sometimes upwards along each side of the raised midrib. But these are, if anything, details of

only specific value in themselves. Morphologically and physiologically the construction is the same. Its occurrence in the series *Oxypetala* detracts from its value as differential of *Nomocharis*. It is not a solitary character distinguishing the series *Oxypetala*. I have pointed out that in bulb-form also these series agree, and the individual differences of their other flower characters—none of them—negate near natural relationship. The series is markedly divergent from the type of *Fritillaria*. It is further away from *Lilium*. It touches *Nomocharis* at several points.

I have yet more to say about this character. The dual basal glandular area confined to the petaline segments has not always the crested form seen in *Nomocharis* and the *Oxypetala* series:—

In the Forrestian plant, No. 10,620,¹ from E.N.W. Yunnan, the gland-construction of *Nomocharis* is repeated with this sole difference—the flap is not fringed.

Another Forrestian plant, No. 493,² from the Mekong-Salween divide, shows the petaline dual basal gland separated by midrib with flaps which are not fringed and are much smaller than in Forrest's No. 10.620.

In a plant collected by Kingdon Ward in S.E. Tibet, under No. 801,³ there is the petaline dual basal glandular area separated by midrib, but each of the areas is most minute with mere trace of flap and without fringe.

Here, then, we have three plants from W. China which have the petaline dual gland-character of *Nomocharis* and the *Oxypetala* series but without the cresting. They are not yet described. They have scaly bulbs, perianth-segments more or less equal, more or less spreading, stamens, as we shall see immediately, with slightly inflated filaments. What is their position?

Androecium.—Of all the characters of his genus *Nomocharis* given by Franchet that of the stamens is the most individual. The filament, which is about 12 mm. long, shows in each of the six stamens two distinct areas. A lower, some 10 mm. or so long, which is swollen into a club-shape, or one might compare it with that of a jargonelle pear. It

¹ Named *Nomocharis Forrestii* on p. 293.

² Named *Nomocharis salweenensis* on p. 294.

³ Named *Nomocharis tricolor* on p. 296.

is as much as 2 mm. in diameter. From the centre of its convex summit there arises abruptly, like an elongated apiculus, a thin needle-like upper portion some 2 mm. long, which is attached by its sharp point to the connective of the anther slightly below the middle. The anther is distinctly dorsifixed. This upper portion of the filament is pale-yellow coloured, in contrast with the dark-coloured, brown or purple lower swollen portion. This lower portion gives the impression of being a hollow sac. It is not really a sac. Through the centre of it runs the vascular bundle, and it is surrounded by a cellular tissue with large intercellular spaces enclosed by some peripheral layers of more compact cells. The large anther, some 7 mm. long swinging on the top of the needle-like upper filament, perched on top of the fat lower filament, is most distinctive. It is a strong character in support of *Nomocharis* as a genus, for it is known nowhere else within this group of forms.

Nevertheless, we are not without approaching forms. They are to be found in the Forrestian plant No. 10,620 and the Wardian plant No. 801 previously mentioned. In them the staminal filaments are swollen in a longer, lower, dark-coloured portion, needle-like in an upper pale-coloured portion, to which the anther is dorsifixed. But the inflation of the lower portion is not nearly so great as in *Nomocharis*—to not quite 1 mm.—and then this lower part does not end in a convex broad top in the centre of which stands the needle-like extension, but narrows into the subulate tip. The areas from which these plants have come to us are not yet fully explored botanically, and these forms suggest that other species more closely linking with *Nomocharis* in this staminal character may yet be discovered.

The dorsifixed anther of *Nomocharis* seems to be a lilioid character of little value for separating it from *Fritillaria*. True basifixed anthers I know of in *Fritillaria* (*Petilium*) *imperialis*, but in all the forms of *Fritillaria* I have cited here the anthers are attached by the back of the connective a short distance at least above their base and always to a finely pointed tip of the filament. It is not merely a case of intrusion of the filament between the prolonged bases of the antherine lobes. Whether in nature the anthers are really versatile, dried specimens do not suffice to determine.

Certainly in the cases of which I am speaking the anthers swing readily on the tips of the filaments after soaking in water, and the somewhat open corolla may allow of this in nature.

Style.—There is nothing distinctive in the style of *Nomocharis*. As in the series of *Oxypetala* and in those undescribed plants from West China of which I have spoken, it is clavate, usually about the same length longer or shorter than the ovary, and the apex is trumpet-shaped with the stigmatic margin more or less 3-lobed. The style of all of them is very different from the tritid style of so many of the species placed in *Fritillaria*.

It is clear, in the light of our increased knowledge, that the position of *Nomocharis* is not so isolated as the characters given by Franchet, drawn from the material at his disposal, indicate. The only character which is peculiar to all the species of *Nomocharis* hitherto described is that of the rounded summit to the swollen lower part of the staminal filament whence an apiculate subulate continuation proceeds. All the other characters appear, or grade into those found, in other plants described or undescribed, as I have endeavoured to show. The question we have to ask and to answer is—Can *Nomocharis* be maintained as a distinct genus? In my opinion it should be maintained but with an extended horizon, and I shall best make clear the grounds of this opinion if I bring together here, in what appears to me to be their natural systematic grouping, the various species, to which I have referred in preceding pages, showing relationship to *Nomocharis*. The species that come into consideration are:—*Fritillaria flavida*, *lophophora*, *oxypetala*, *Stracheyi*; undescribed, Ward sp. No. 758, Ward sp. Nos. 741, 813; *Nomocharis leucantha*, *Mairei*, *meleagrina*, *pardanthina*; undescribed, Forrest sp. No. 493, Forrest sp. No. 10,620, Ward sp. No. 801.

They all agree in these characters:—

Scaly bulb with elongated ovate-lanceolate or lanceolate fleshy scale-leaves. Perianth-segments always obscurely fringed at the tip. Petaline segments only possessing basal gland divided into two by prominent midrib. Anthers dorsifixed. Style clavate short about equal to ovary, trumpet-shaped at end with three-lobed stigma.

They fall into three series, to which I have given names:—

1. *Oxypetala*.—Bulb small with many narrow not connivent scale-leaves. Stem one-flowered not rooting above bulb. Foliage-leaves linear sparse. Perianth funnel-shaped or concave. Perianth-segments equal or slightly unequal, rarely petals fringed at base. Petaline glands crested all over. Staminal filaments not inflated.

Here belong:—*Fritillaria flavida*, *lophophora*, *oxypetala*, *Stracheyi*; undescribed, Ward sp. No. 758, Ward sp. Nos. 741, 813.

2. *Euuomocharis*.—Bulb larger with few ovate lanceolate fleshy scale-leaves. Stem racemosely flowered rooting above bulb. Foliage-leaves oval-lanceolate or lanceolate, whorled, sparse below and sometimes above. Perianth open, often flat. Perianth-segments usually dissimilar, petals broadest, usually dentate-fringed above middle or erose. Petaline glands with fan-shaped, fringed lap. Staminal filaments pyriform, much inflated, convex at top with much shorter subulate tip springing from centre.

Here belong:—*Nomocharis leucantha*, *Mairei*, *meleagrina*, *pardanthina*.

3. *Ecristata*.—Bulb larger with many fleshy lanceolate scale-leaves. Stem racemosely flowered or with 1 terminal flower, rooting above bulb. Foliage-leaves lanceolate sparse or in pairs. Perianth more or less open. Perianth-segments subequal entire below tip. Petaline glands with a flap not fringed. Staminal filaments slightly inflated, tapering into much shorter subulate tip.

Here belong:—Undescribed, Forrest sp. No. 493, Forrest sp. No. 10,620, Ward sp. No. 801.

The whole of them approach *Lilium* in their bulb. They diverge in the petaline glands. If anyone be bold enough to combine in one genus *Lilium* and *Fritillaria*, then all these forms would also go into the new combination. But I do not see what advantage would be gained by such an aggregation, either as giving a phyletic picture or as a statement of observed facts.

From *Fritillaria*—to which in outward appearance the first series in particular shows great resemblance—they diverge in the bulb form, the more or less open perianth, and the petaline glands.

To refer all these forms to *Fritillaria*—an obvious suggestion—notwithstanding the difference, would be to ignore, I think, evident phyletic developments which have gone quite as far in a divergent direction from *Fritillaria* as to warrant segregation of the forms presenting them in a named genus. If we were to include them in *Fritillaria* they would claim the position of a subgenus. Certainly, as generic characters go in Liliaceae, the characters which

I have given above as the possession of all these plants seem to me to be adequate for the diagnosis of one, and what I am tempted to do is to use these characters as the differentiating ones of *Nomocharis*, taking the three series arranged above as sections of it, naming them, 1, *Oxypetala*; 2, *Eunomocharis*; 3, *Ecristata*. By this procedure we should emphasise the fact that we have a phyletic series that diverged from a common ancestry along with *Fritillaria* proper, and with that remarkable arrested branch which is conveniently placed because of lack of further evolution of its form in *Fritillaria* as *F. imperialis*. I have no difficulty about combining in one genus the forms of series 2 and 3 and about keeping it distinct from *Fritillaria*. I am more hesitant about the right treatment of series 1, for its members undoubtedly in habit—slender plants with stem not rooting above bulb, leaves long linear solitary at nodes, solitary terminal more or less drooping flower—recall strongly *Fritillaria*. But it would not be so natural an arrangement, it seems to me, to place series 1 in *Fritillaria* and to treat the other two series as *Nomocharis*. And so I decide to yield to temptation and to state the view that the best expression of our present knowledge of these forms of which I have been speaking is to widen the limits of *Nomocharis* to the extent of including them all within it, arranging them in the series with the names already given and distinguished by the characters mentioned.

The decision enables me to name the several species to which in previous pages I have referred under collector's numbers, and it requires me also to give a revised definition of the genus *Nomocharis* as follows:—

Nomocharis. (Revised Character.)

Perianth deciduous, more or less open; segments subequal or dissimilar, lanceolate or oval or almost orbicular more or less acuminate, obscurely fimbriate at apex elsewhere entire or variously fringed, more or less spreading; calycine eglandular; petaline with a double basal glandular area half on each side of midrib crested or fringed or not. Stamens 6 slightly adhering to base of perianth-segments or free; filaments flattened, thread-like

or swollen below and gradually or suddenly ending in a needle-like tip; anthers oblong dorsifixed, dehiscing longitudinally at the sides. Ovary sessile 3-locular, 3-angular, angles rounded; style clavate short about equalling ovary, trumpet-shaped at apex with 3-lobed marginal stigma. Bulb squamate, scales fleshy elongated, ovate-lanceolate acute or acuminate. Stem simple, leafy. Leaves alternate or whorled or both. Flowers showy, stalked, nodding, solitary terminal or distant—as many as 6—on long leafy racemes.

A genus of some thirteen species from the Himalayas and W. China.

Three sections of the genus may be recognised:—

1. *Oxyptala*.—Including *N. Wardii*, Ward sp. No. 758, and the species described under *Fritillaria* as *F. flavida*, *F. lophophora*, *F. oxyptala*, *F. Stracheyi*.
2. *Eunomocharis*.—Including *N. leucantha*, *N. Mairei*, *N. meleagrina*, *N. pardanthina*.
3. *Ecristata*.—Including *N. Forrestii*, *N. saluenensis*, *N. tricolor*.

The following are descriptions of new species:—

Nomocharis Forrestii, Balf. f.¹ (Sect. *Ecristata*.)

A tall growing glabrous plant reaching 1 m. or more. Bulb scaly elongated, scales fleshy ovate-lanceolate at first acuminate or acute, apex soon shrivelling and falling off. Stem stout about 8 mm. in diameter below foliage-leaves, rooting above the bulb. Foliage-leaves distant solitary at the nodes below the inflorescence, where they are paired, lanceolate long-acuminate as much as 7 cm. long 2 cm. broad, dark green above, glaucous beneath, conspicuously 3-veined with parallel subsidiary veins. Flowers large distant in a 6-flowered (or more) raceme with paired linear-lanceolate green leaves; pedicels stiff stout about 2 mm. in diameter horizontal deflexed at tips.

¹ *Nomocharis Forrestii*, Balf. f.—Bulbus squamatus elongatus. Caulis ad 1 m. vel ultra, supra bulbum radicans. Folia distantia, inferiora sparsa, superiora inter flores per paria verticillata, lanceolata longe acuminate ad 7 cm. longa 2 cm. lata. Flores in racemum 6-florum laxè dispositi; pedicelli horizontaliter patentes ad apicem deflexi. Perianthium late patens ad 10 cm. diam. pallide roseum nitens maculatum et basi kermesino-variculosum; segmenta ovalia vel ovalia-lanceolata acuminate, sub apice obscura fimbriato integra; calycina eglandulosa; petalina basi bifoveolata foveolae cujusque labio ecristato. Stamina 6 circ. 1.7 cm. longa; filamenta ovarium subaequantia, infra inflata, in apicem brevem subulatum attenuata; antherae infra medium dorsifixae.

Perianth widely open, about 10 cm. across nearly flat, satiny pale rose spotted and blotched deep crimson; segments of about the same length and width about 5 cm. long and 2.5 cm. broad more or less ovate or ovate-lanceolate, all entire and acuminate, the tip ciliate with club-shaped short white processes; sepaline segments without a basal nectar gland but always with a darker spot at the very base; petaline segments bearing a basal dark-coloured two-lobed nectariferous gland the large lobes separated by the prominent midrib, each lobe with a free rounded swollen not fringed or crested flap. Stamens about 1.7 cm. long; filaments about equal in length to ovary slightly flattened at very base, upwards dark-coloured and slightly swollen as much as 1 mm. in diameter to about 1 mm. below anther, pointed not rounded at top and passing gradually into a thin subulate paler portion attached to anther at about 2 mm. above its base; anther about 7 mm. long. Ovary about 1.2 cm. long oblong and widening upwards, about 3.5 mm. in diameter at top, 6-angled, 6-lobed at top, very finely shagreened; style slightly shorter than ovary about 1 cm. long clavate at top beneath the trumpet-shaped 3-lobed stigma.

E.N.W. Yunnan:—Mountains in the N.E. of the Yangtze bend. Open alpine pasture. Alt. 13,000 ft. Lat. 27° 45' N. Plant of 2 ft. Flowers satiny pale rose, spotted and blotched deep crimson. G. Forrest. No. 10,620. July 1913.

In habit like *N. leucantha*, but a much taller plant and easily recognised by the nearly equal perianth-segments, the non-crested petaline glands, the less swollen filaments of the stamens not rounded at top of swollen portion.

Nomocharis saluenensis, Balf. f.¹ (Sect. *Ecristata*.)

Glabrous tall herb as much as 1 m. high. Roots thick fleshy. Bulb scaly oblong about 3 cm. long, scale-leaves

¹ *Nomocharis saluenensis*, Balf. f.—Planta ad 1 m. alta. Bulbus oblongus squamatus. Caulis crassiusculus internodiis brevibus, supra bulbum radicans. Folia inferiora sparsa, superne per paria distributa lanceolata breviter acuminata, ad 7 cm. longa 2 cm. lata. Flores 3 racemosi lati; pedicelli folia aequantes, divaricati. Perianthium albido roseum maculatum patens ad 9 cm. diam.; segmenta sepalina oblongo-ovalia utrinque angustata subobtusata eviriculosa eglandulosa; petalina paullo longiora et latiora subelliptica apice lata obtusa basi kermesino-

fleshy ovate-lanceolate acuminate the tip drying off. Stem stout about 6 mm. in diameter below the foliage-leaves, rooting above the bulb. Foliage-leaves solitary at the nodes below the inflorescence, truly lanceolate as much as 7 cm. long 2 cm. broad shortly acuminate, narrowed to the base and there contracted into a short and broad petiole some 5 mm. long and 4 mm. broad, conspicuously 3-5 veined with subsidiary parallel veinlets, apparently concolorous above and below. Inflorescence racemose 3-flowered, leaves on the inflorescence-axis in pairs; flowers large on a stout more or less nodding pedicel about same length as leaves. Perianth broad open approaching 9 cm. across, pale whitish rose with purplish rose spots on all segments more or less: sepaline segments oblong-oval narrowed to both ends most to the tip, narrowly obtuse ending in a conspicuous hydathodal mucro, 4.4 cm. long 2.2 cm. broad, unblotched at base, without a basal nectary; petaline segments slightly broader and shorter and overlapping the sepaline ones about 4 cm. long 2.4 cm. broad sub-elliptic narrowed to both ends broadly obtuse at apex, dark red-purple blotched at base and there provided with two cushion-like pocket-nectaries one on each side of mid-rib, flap of pocket not fringed nor crested. Stamens 6 about 1.4 cm. long; filaments about 1.1 cm. long flattened at the base then terete swollen dark-coloured to about 1 mm. from end, tip subulate 1 mm. long pale coloured; anther about 6 mm. long oblong thick dorsifixed about the middle. Gynaeceum about 1.2 cm. long; ovary about 7 mm. long shorter than filaments, 6-grooved the ridges between grooves rounded, 6-lobulate at summit, slightly wider at top, about 2.5 mm. in diameter; style clavate about 5 mm. long, shorter than ovary, trumpet-shaped at top with 3-lobed marginal stigmas.

N.W. Yunnan:—Mekong-Salween divide. Open moist situations. Alt. 9000-10,500 ft. Lat. 28° 12' N. Plant of 2-3 ft. Flowers pale whitish rose marked purplish rose on interior. G. Forrest. No. 493. Sept. 1904.

This is one of the plants referred to *Lilium apertum* varicunlosa biglandulosa glandulae labio integro ecristato efimbriato crescentico. Stamina ad 1.4 cm. longa; filamenta ovario paullo longiora infra paullo inflata in apicem subulatum ad 1 mm. longum attenuata; antherae circ. medium dorsifixae.

var. *thibeticum*, Franch. in *Plantae Forrestianae*.¹ It is not the same as Forrest No. 457 referred to the same variety. No. 457 is not a *Nomocharis*, and I do not deal with it here, for the material is hardly adequate for critical decision upon its proper place. Forrest No. 493 is certainly not *Lilium apertum*, Franch. It may be the plant Franchet referred to *L. apertum* var. *thibeticum*, which from the diagnosis Franchet gives and in the light of present knowledge I doubt being a variety of his *L. apertum*. In default of actual specimens I cannot decide. Were there certainty, Franchet's varietal name might be attached to this species of *Nomocharis*, but in the circumstances confusion in nomenclature may be avoided by naming it as I have done *N. saluenense*, leaving to future investigation the settlement of relation to *L. apertum* var. *thibeticum*.

The species is a distinct one in the genus. One of Monbeig's plants under No. 68/1912 in the Edinburgh Herbarium, collected near Tseku, is a *Nomocharis* and a near ally of *N. saluenensis*, but the material is not sufficient for certain diagnosis.

Nomocharis tricolor, Balf. f.² (Sect. *Ecristata*.)

Glabrous plant as much as 35 cm. high. Bulb scaly ovate-oblong about 3 cm. long, scales fleshy ovate-lanceolate acuminate. Stem fleshy rooting above the bulb, about 2.5 mm. in diameter below the foliage-leaves. Foliage-leaves single at the nodes below, more or less paired or in whorls of three towards the top, lanceolate shortly acuminate 4-5 cm. long about 1.2 cm. broad more or less, dark green above, paler somewhat glaucous beneath, with three conspicuous nerves and some subsidiary parallel ones. Flower large solitary terminal erect or slightly nodding; pedicel stout about 3.5 cm. long. Perianth openly concave

¹ Notes R.B.G. Edin., vii (1912), 38.

² *Nomocharis tricolor*, Balf. f.—Bulbus squamatus. Caulis ad 1 m. vel ultra, supra bulbum radicans. Folia sparsa superne plus minusve 2-3-verticillata, lanceolata acuminata 4-5 cm. longa, ad 1.2 cm. lata, subtus pallida subglaucous. Flores solitarii ad 8 cm. lati; pedicelli ad 3.5 cm. longi. Perianthium aperte concavum roseum luteo-oculatum basi rufescenti-maculatum et varicosum; segmenta subaequalia ovalia vel oblongo-ovalia acuminata apice excepta integra; calycina eglandulosa; petalina basi bifoveolata foveolae cujusque parvulae labio ecristato. Stamina ad 1.5 cm. longa; filamenta ovario sublongiora, infra inflata, in apicem brevem subulatum attenuata; antherae circ. medium dorsifixae.

as much as 8 cm. across, rose-coloured with a broad yellow eye, spotted and blotched at base dark purple-red; segments subequal outer a little longer about 4 cm. long almost 2 cm. broad oval or oblong-oval shortly acuminate, tip obscurely fringed otherwise margin quite entire; sepaline segments eglandular; petaline segments bifoveolate at base, foveola on each side of midrib small with a short convex not crested flap. Stamens 6 about 1.5 cm. long; filaments about 1.2 cm. long a little longer than ovary from a slightly flattened base upwards dark-coloured, swollen to nearly 1 mm. in diameter through about 9 mm., then tapered through about 3 mm. as a needle-like thread; anther about 6.5 mm. long dorsifixed about the middle. Ovary about 9 mm. long oblong slightly wider at top; style about same length as ovary, clavate.

S.E. Tibet. Ka-gwr-pw. Alpine meadow. 14,000 ft. F. Kingdon Ward. No. 801. 19.7.13.

A very distinct species. Easily recognised by the tricoloured flower.

Nomocharis Wardii, Balf. f.¹ (Sect. *Oxypetala*.)

Glabrous low herb some 12 cm. high. Roots thick fleshy. Bulb scaly slender oblong elongated as much as 3 cm. long 1 cm. in diam., outermost scale-leaves at flowering time mucilaginously rotting, within scales of the year straw-coloured few 5-6 open fleshy linear-lanceolate acuminate apex soon withering. Stem short about 3 cm. above ground thin with short internodes and bearing at most about 8 alternate ascending leaves. First leaves short more or less cataphyllary at and below soil surface, green foliage-leaves linear-ligulate as much as 9.5 cm. long 8 mm. broad with long attenuate hardly acute point, slightly paler below,

¹ *Nomocharis Wardii*, Balf. f.—*Glabra humilis*. Bulbus elongatus ad 3 cm. longus tenuis squamatus, squamis paucis (5-6), apertis carnosis anguste lanceolatis acuminatis apice mox marcescente. Caulis epigeus brevis ad 3 cm. longus. Folia basalia 1-2 squamosa, superiora circ. 8 alterna lineari-ligulata ad 9.5 cm. longa 8 mm. lata subtus pallidiora. Flores solitarii ad 9 cm. lati; pedicelli ad 8 cm. longi apice cernui. Perianthium luteum emaculatum aperte concavum; segmenta fere consimilia anguste lanceolata longe acuminata margine sub apice obscure fimbriato integra; calycina eglandulosa; petalina glandula basali bipartita labio cristato instructa. Stamina ad 1.8 cm. longa; filamenta ovario longiora infra paullo inflata in apicem brevem subulatum attenuata; antherae infra medium dorsifixae.

with midrib and two lateral veins conspicuous and some subsidiary parallel nerves. Flower solitary terminal with a long stout brown glossy pedicel as much as 8 cm. long 1.5 mm. in diameter, straight erect to nodding swollen apex. Perianth openly concave about 9 cm. across yellow unspotted blotched at the base; segments similar in form narrowly ovate-lanceolate tapering to a long acuminate point which is obscurely fimbriate: calycine about 4 cm. long 1 cm. broad, basal blotch small, eglandular; petaline about 3.7 cm. long 1.2 cm. broad with a 2-lobed basal gland half on each side of prominent midrib, each lobe yellow-fringed the fringe or crest running upwards for a very short way along the midrib. Stamens 6 about 1.8 cm. long; filaments about 1.2 cm. long longer than ovary slightly flattened at very base, slightly swollen upwards to about 1 mm. from top then attenuate in a subulate tip; anther about 9 mm. long shortly apiculate dorsifixed about 3 mm. from base. Gynaeceum about 2 cm. long; ovary oblong pyriform 6-angled, angles rounded faintly 6-tubercled at summit; style about 1.2 cm. long clavate beneath the trumpet-shaped end with marginal 3-lobed stigma.

S.E. Tibet:—Doker La. Open grassland. Shrub and forest belt. Alt. 13,000–14,000 ft. F. Kingdon Ward. No. 741. July 1913.

S.E. Tibet:—Ka-gwr-pw. Alpine meadow turf. Alt. 15,000 ft. F. Kingdon Ward. No. 813. 19.7.13.

A beautiful species not yet in cultivation. Its nearest ally is the plant described by Franchet as *Fritillaria lophophora*,¹ afterwards renamed by him *Lilium lophophorum*.² Ward's plant can be recognised by its grass-like foliage and the many more leaves which each stem bears. I do not find on the petaline segments of *N. Wardii* any marginal fimbriation at the base such as characterises Franchet's species, and is perhaps more constant than Franchet supposed to be the case.

This *F. lophophora* of Franchet has particular interest in relation to the question of the limits of the genus *Nomocharis* which we have been considering. When he described

¹ Franchet in Journ. de Bot., v (1891), 153; Oliv. in Hook. Ic. Pl., xxiii (1894), t. 2219.

² Franchet in Journ. de Bot., xii (1898), 221.

the species Franchet recognised the likeness to *Nomocharis* in the form of bulb and the crested petaline glands. At that date *N. meleagrina*, with its almost similar perianth-segments, was unknown, and Franchet naturally laid stress upon the dimorphous perianth as a mark separating *Nomocharis* from his new species. Now we know the character fails in generic diagnosis, and the stamens subulate from the base in *F. lophophora* are alone left of the points of difference named by Franchet to distinguish it from *Nomocharis*. Here, now, in *Nomocharis Wardii* we have an approach to the abolition of this staminal distinction. The filaments are inflated, though not to the extent of those in the first described species of *Nomocharis*, and in consequence of this less inflation the subulate top of the filament appears as a gradual attenuation of the swollen portion—does not sit like an apiculus on its summit. Whilst treating *F. lophophora* as a *Fritillaria*, Franchet did not do so without qualification. He recognised those characters of the bulb and the petaline glands, to which I have drawn attention, as alien to *Fritillaria*, and he proposed to constitute under the name of *Lophophora* a new section of *Fritillaria*, to be characterised thus:—"Bulb squamate; perianth-segments not dissimilar, traversed at the claw by crested fimbriate lamellae; staminal filaments subulate; style undivided." These characters are found, as I have shown, also in *F. oxypetala*, *F. Stracheyi*, and I believe also in *F. flavida*. They are the essential characters of my section *Oxypetala* of *Nomocharis*. Franchet has preferred to use the characters for a distinct section of *Fritillaria*. I have preferred to widen the scope of *Nomocharis* and make a section in that genus—and because

- (a) the bulb and the petaline glands are not fritillarioid but are nomocharoid;
- (b) the obstacle of the nomocharoid staminal filaments is broken down by the almost transition in *N. Wardii* and the *Ecristata* section of *Nomocharis*.

There is a middle course—to make a new genus for these *Lophophoras* and *Oxypetalas* intermediate to *Fritillaria* and *Nomocharis*. That may come when we know more of this group of plants, which appears to have attained

to some considerable development in Western China—and be it noted alongside of a similar development of true *Fritillaria* with the globose bulb formed of rounded, somewhat separate scale-leaves, and with the campanulate perianth of segments all bearing a larger or smaller median nectary—*F. cirrhosa*, *F. decussata*, *F. Delavayi* are illustrations. We may count upon more of both groups being discovered, showing perhaps other modifications into which the type has passed. Meanwhile, as I had to name the plants collected by George Forrest and by Kingdon Ward, I have endeavoured to sift the relationship of forms as we know them.

In 1898 Franchet translated *Fritillaria lophophora* into *Lilium lophophorum*, because “it has so much in common with *Lilium oxypetalum*, Baker, and *L. apertum*, Franch., that it is impossible to place it in a different genus. The bulb, the form of perianth, the dorsifixed versatile anthers are more characters of *Lilium* than of *Fritillaria*—a genus which cannot be precisely defined at the present time unless one restricts it to species with a campanulate corolla of the type of that in *F. Meleagris*, and especially to those in which the style is trifid.” I agree with Franchet, except that his argument leads me not to *Lilium* but to a new genus or to *Nomocharis*, qualifying this statement, however, by saying that I have not had opportunity of examining *Lilium apertum*, which I take to be a plant not unlike *L. oxypetalum*, Baker, seeing that Franchet had previously thought it was this species.